

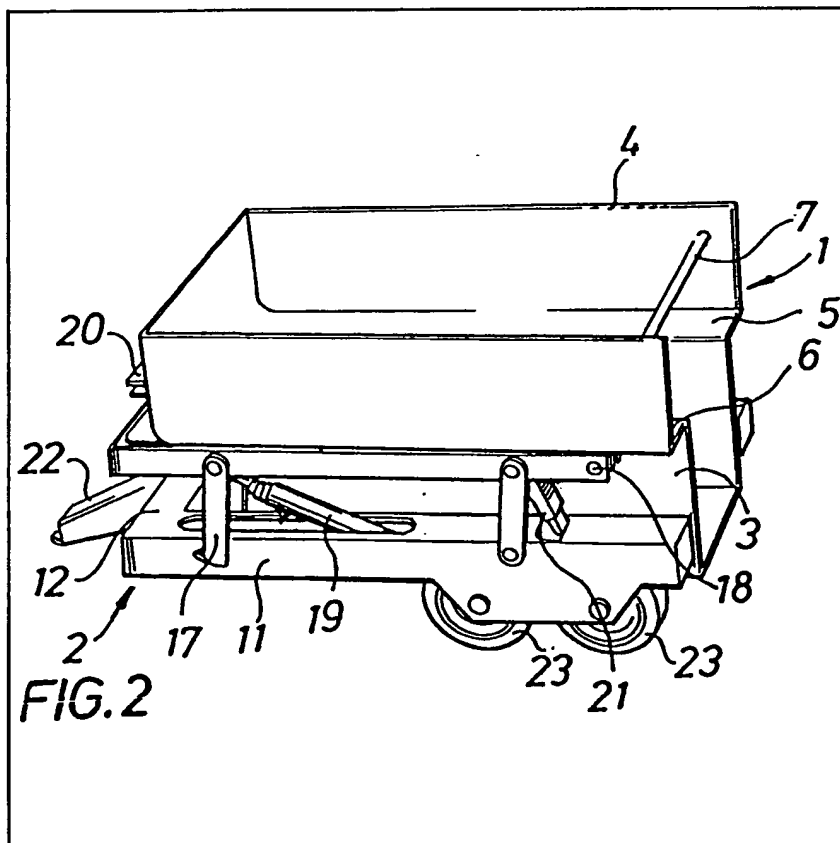
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B8Q
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- (71) Applicants
Timothy Raymond
Warner,
12 Cedar Drive,
Bracknell,
Berkshire.
- (72) Inventors
Timothy Raymond
Warner
- (74) Agents
Eric Potter and Clarkson,
5 Market Way,
Broad Street,
Reading RG1 2BN.

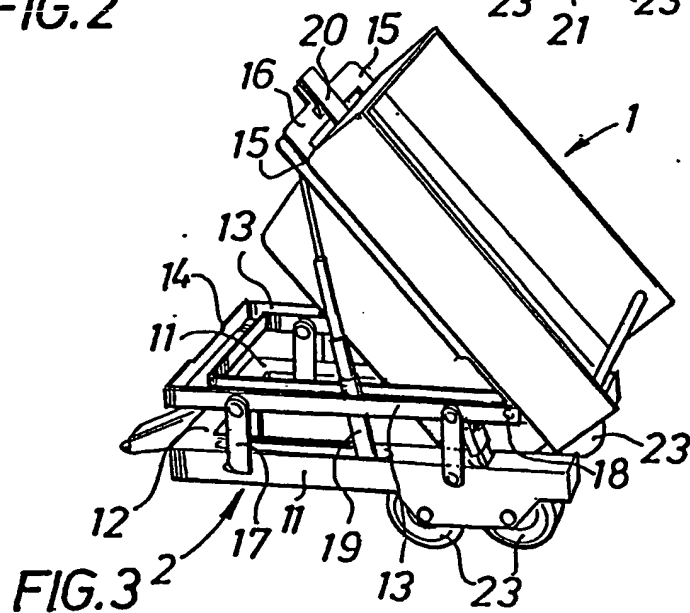
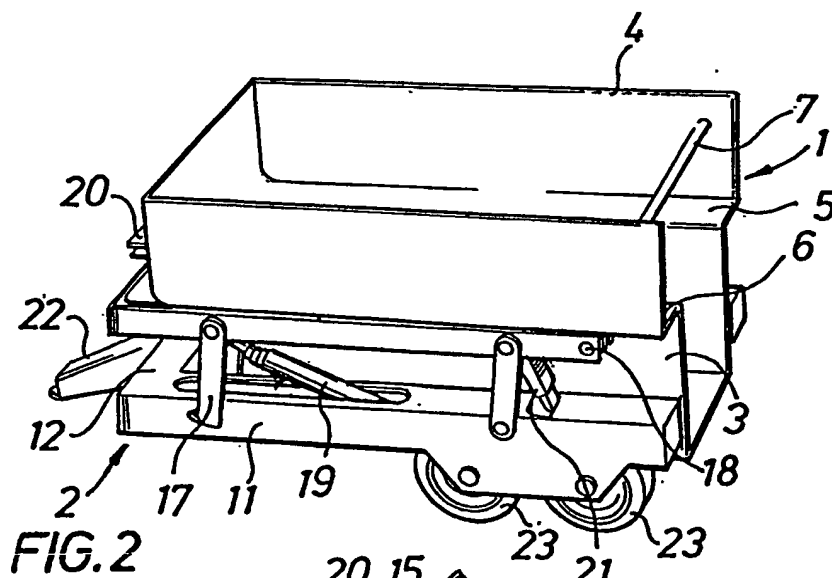
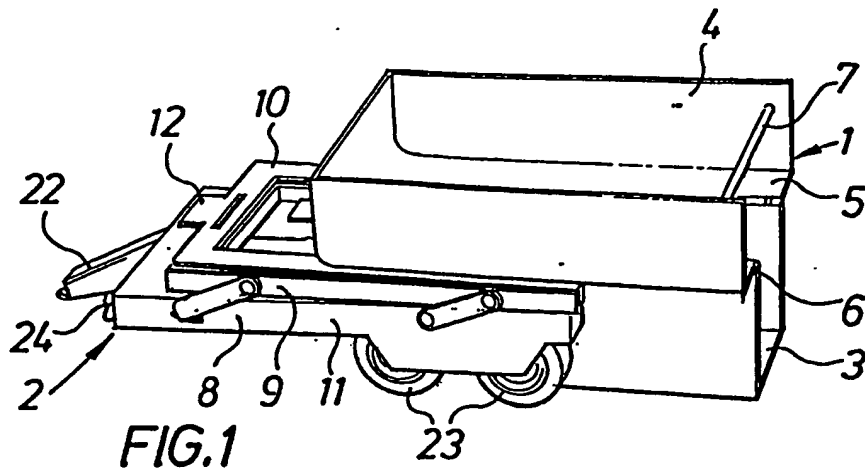
(54) Materials handling system and apparatus

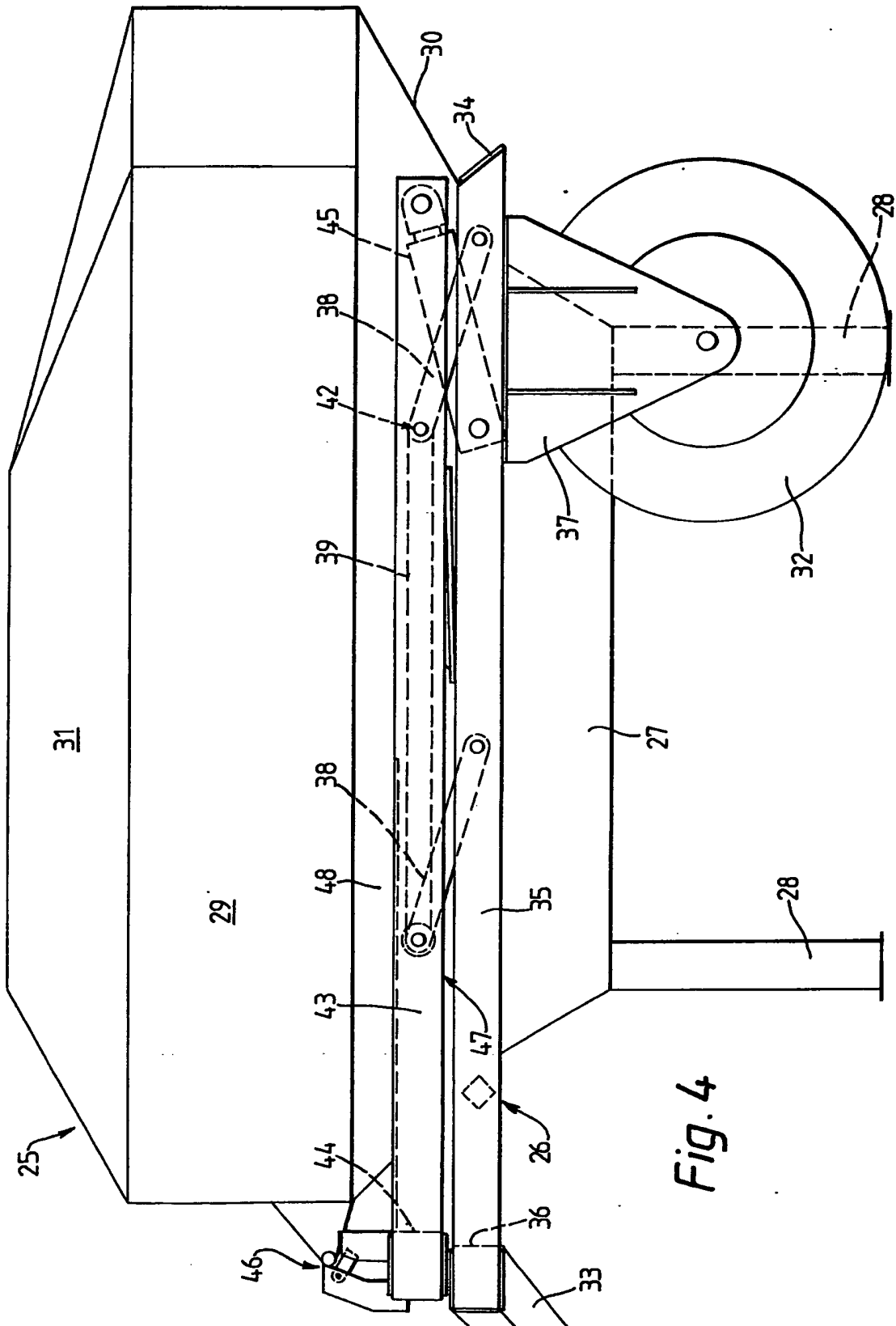
(57) A materials handling system comprising a load carrier (1) having a ground engaging portion (3) and a downwardly directed surface (6) extending laterally outwards on either side of the ground engaging portion (3) and a wheeled carriage (2) comprising a

main frame having spaced parallel side members (11) on which is mounted lifting means. The lifting means comprises spaced elongate members connected to the side members (11) by parallel linkages (17) and movable between a lowered position and a raised position by jacks (19). Tipping means comprising longitudinally extending members pivotally connected to one end of the elongate members and movable between a normal out-of-use position and a tipping position by the jacks (19) may be provided for tipping a load carrier (1) supported on the lifting means. The wheeled carriage (2) is adapted to straddle the ground engaging portion of the load carrier (1) with the lifting means positioned beneath said downwardly directed surfaces (6) so that the lifting means can be actuated to raise the load carrier to a transport position in which the ground engaging portion thereof is clear of the ground.



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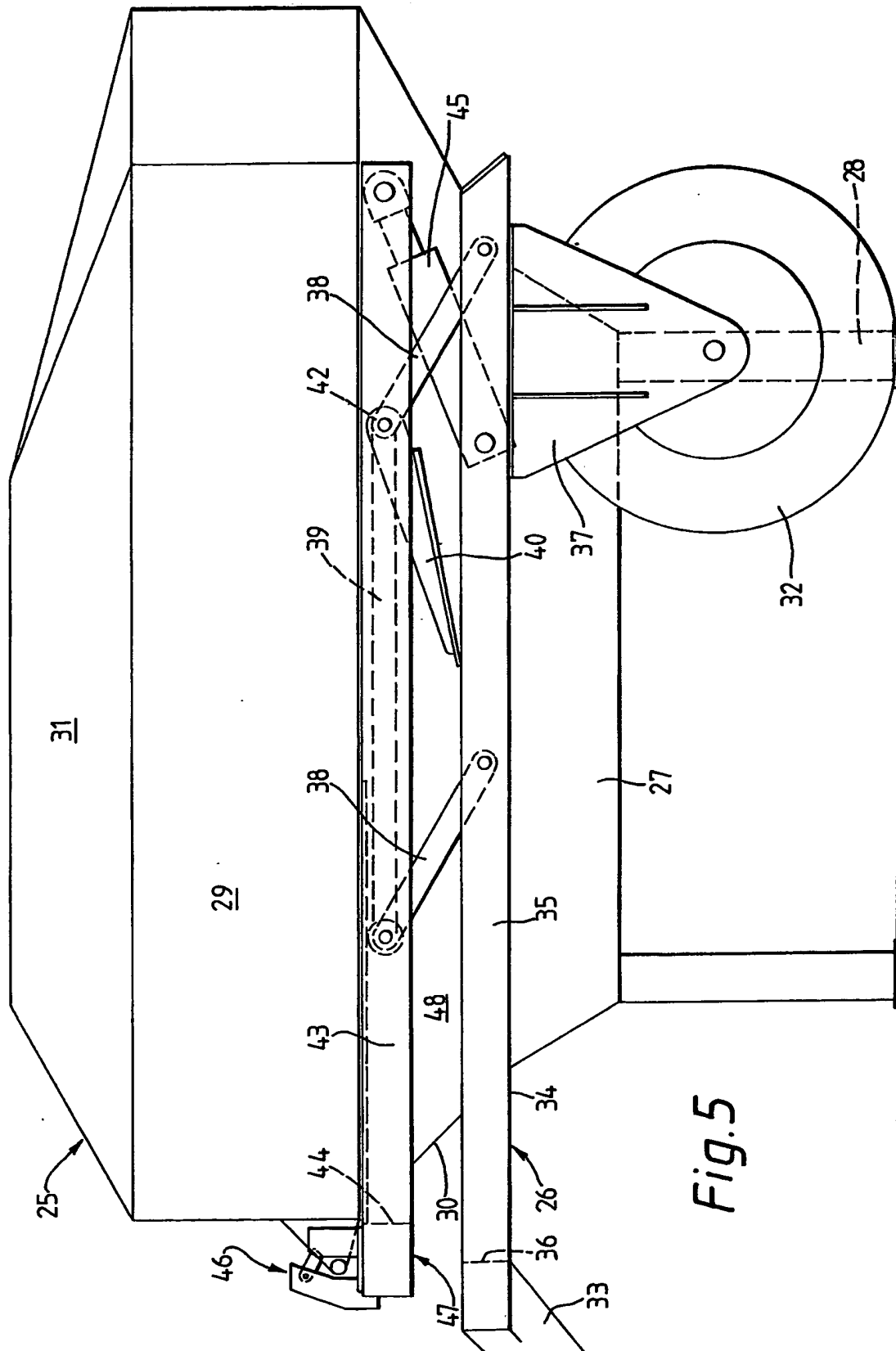


Fig. 5

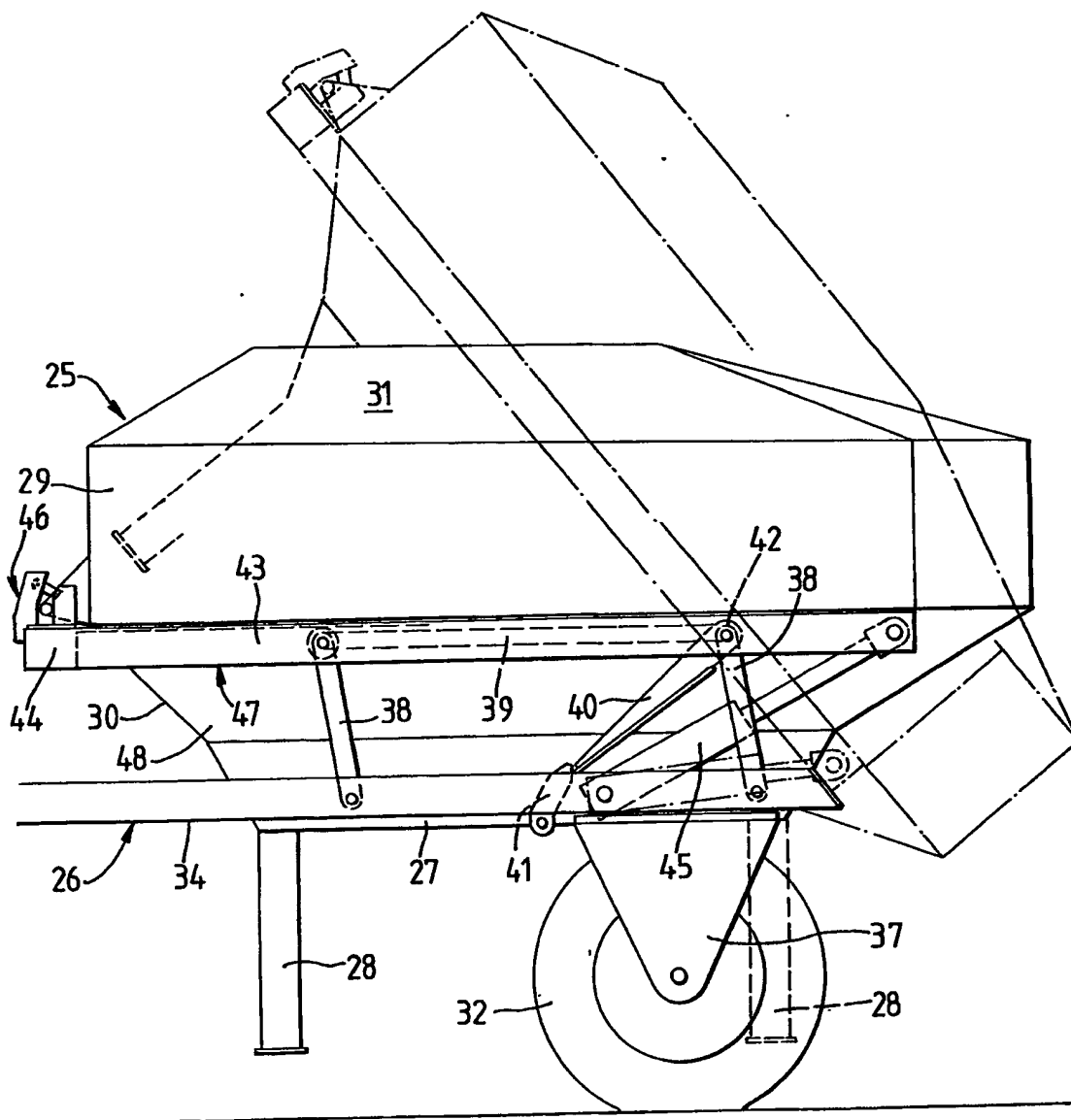


Fig. 6

SPECIFICATION

Materials handling system and apparatus

5 The present invention relates to materials handling systems and apparatus.

One known system of materials handling is in the field of refuse collection wherein it is known to provide large load carrying bins which can be left at a refuse collection site for loading with refuse and which, when full, can be picked up and transported to, e.g., a refuse tip using a specially adapted motor vehicle. Generally the motor vehicle will comprise means for supporting a said refuse bin and overhead lifting means for lifting the bin and transferring it from said supporting means onto the ground and vice versa. Such materials handling systems involve heavy capital expenditure because the specially adapted motor vehicles are extremely expensive. Moreover, the system is not entirely satisfactory in use in that when a fully loaded bin is mounted on the motor vehicle for transport the centre of gravity of the load is so high as to render the motor vehicle unstable, particularly on rough terrain. Also materials handling systems of the kind aforesaid are very limited in their materials handling capability since they are really only suitable for the transport of materials which can be loaded into a bin.

The present invention has as its object to provide a materials handling system and apparatus which is both more effective and more versatile than said known system and which, according to a preferred embodiment, can make use of existing power units and so save the necessity and high capital expenditure of specially adapted motor vehicles.

The present invention provides a materials handling system comprising at least one load carrier and a wheel carriage for the transport of said load carrier, the load carrier comprising a ground engaging portion and at least one downwardly directed surface extending laterally outwards on either side of said ground engaging portion at a predetermined height above the bottom of said ground engaging portion, and said wheeled carriage comprising (a) a main frame having a pair of spaced substantially parallel side members and means connecting said side members together at one end only and (b) lifting means mounted on said main frame and having a retracted position less than said predetermined height and a raised position greater than said predetermined height, the arrangement being such that with said load carrier supported on the ground and said lifting means in retracted position, said carriage can be wheeled into a position carrier and said lifting means are positioned beneath said downwardly directed surfaces of the load carrier so that moving the lifting means to raised position will raise the load carrier from the ground for transport on the carriage.

The present invention also provides a load carrier for a materials handling system according to the present invention, the load carrier comprising a ground engaging portion and at least one downwardly directed surface extending laterally outwards on either side of said ground engaging portion at a

predetermined height above the bottom of said ground engaging portion.

The invention further provides a wheeled carriage for a materials handling system according to the present invention, the wheeled carriage comprising (a) a main frame having a pair of spaced substantially parallel side members and means connecting said side members together at one end only, and (b) lifting means mounted on said main frame and having a retracted position and a raised position.

Said load carrier can take a variety of forms and may comprise, for example, a bin for the transport of refuse, discrete materials such as sand or gravel, etc., a flat platform either with or without upstanding peripheral walls or supports thereon for the transport of, e.g., crops such as sugar cane, elongate articles such as pipes or tubes, bricks, paving slabs, or other suitable materials, or an enclosed tank, e.g., a cylindrical tank, for the transport of fluid materials such as gases, liquids, or powder or granular materials. The only criteria is that the load carrier must comprise a ground engaging portion which can be straddled by the open-ended wheeled carriage and said downwardly directed surfaces extending laterally outwards on either side of the ground engaging portion for engagement by the lifting means. The ground engaging portion of the load carrier may comprise part of the load carrying portion of the load carrier or may comprise leg support means for supporting a load carrying portion of the load carrier. For example, where the load carrier is in the form of a bin then this may have a lower ground engaging portion of a width which can be straddled by the wheeled carriage and an upper portion of greater width connected to the lower portion by transverse step portions which provide said downwardly directed surfaces. Where the load carrier comprises a flat platform then either this can be mounted on suitable leg support means which provide the ground engaging portion and which can be straddled by the wheeled carriage, the platform extending laterally beyond the leg support means at either side to provide said downwardly directed surfaces or the platform itself may comprise the ground engaging portion and may be of a width such that it can be straddled by the wheeled carriage, in which case means will be provided at opposite sides of said platform which extend upwardly then outwardly to provide said downwardly directed surfaces. Said downwardly directed surfaces may be horizontal surfaces or may be surfaces which extend laterally outwards and upwards from the ground engaging portion so that the load carrier is self-centering when engaged by the lifting means.

Said wheeled carriage is preferably U-shaped in plan view, the main frame thereof comprising said pair of spaced substantially parallel side members and a transverse member or members which connects said side members together at one end only. Said lifting means may be mounted at least on said side members and may comprise any lifting means capable of being moved between a raised and a retracted position, e.g. may comprise hydraulic, electro-hydraulic, pneumatic or screw jack means. Preferably, said lifting means comprises a spaced

pair of elongate members each of which is connected to one side member of the main frame and is movable, as by suitable jack means, between a lowered position and a raised position. Preferably each of said elongate members is connected to its respective main frame side member by parallel linkages which will maintain it in parallelism with the frame side member as it is moved between said lowered and raised positions. According to a preferred embodiment of the present invention said elongate members are connected together by a transverse member at the same end thereof as the side frame members are connected together so that the lifting means comprises a U-shaped sub-frame mounted on and movable relative to the main frame. It is preferred that the wheeled carriage be capable not only of lifting and transporting said load carrier but also of tipping the load carrier so as to facilitate the removal of materials therefrom. To this end said elongate members may each have pivotally connected thereto at one end thereof a longitudinally extending member and means may be provided for raising the other end of each of said longitudinally extending members so as to tip a load carrier supported by its said downwardly directed surfaces on said longitudinally extending members. Again said longitudinally extending members may be connected together at that end thereof which corresponds to said one end of said side members. Thus said tipping means may comprise a further U-shaped auxiliary tipping frame mounted on and pivotally connected to one end of said sub-frame. Means may be provided on said tipping means whereby a said load carrier can be releasably connected thereto to prevent the load carrier sliding off the tipping means during the tipping operation. Likewise, suitable releasable locking means may be provided for maintaining said sub-frame in its raised position during transport of a said load carrier. The means for raising said other ends of said longitudinally extending members may be separate from the means for moving the elongate members between their lowered and their raised portions. However, according to a preferred embodiment, the same means is utilised for both raising the elongate members and for tipping the longitudinally extending members. Such means may comprise a suitable jack or jacks, e.g. a pair of hydraulic or pneumatic jacks. According to one embodiment a pair of jacks is provided one end of each of which is pivotally connected to one of said main frame side members and the other end of each of which is pivotally connected to said other end of one of said longitudinally extending members, the arrangement being such that initial extension of said jacks will move said elongate members between their lowered and their raised positions and continued extension of said jacks will raise said other ends of said longitudinally extending members. If desired or necessary means may be provided for releasably securing said longitudinally extending members to said elongate members whilst said elongate members are being moved between their lowered and their raised positions.

According to another embodiment said longitudinally

extending members extend at one end beyond said one end of the elongate members and are pivotally connected to the elongate members at said one end of the elongate members only and a jack is connected between each of the of the main frame side members and said one end of the longitudinally extending members. Releasable locking means is provided for locking the elongate members in their raised position with this arrangement the jacks are extended to move the elongate members to their raised position said locking means engaged to lock the elongate members in raised position and the jacks retracted to pivot the longitudinally extending members on the elongate members and so effect tipping. The reverse procedure i.e. extension of the jacks, release of the locking means and retraction of the jacks, first returns the longitudinally extending members to their normal untipped position and then moves the elongate members to their lowered position.

If desired the wheeled carriage of the materials handling system of the present invention could comprise a motor vehicle. According to a preferred embodiment, however, the wheeled carriage comprises a trailer which is adapted to be releasably connected to and towed by a suitable motor vehicle, e.g., a suitable tractor or tractor unit. The wheeled carriage may have as many wheels or axles as is thought desirable or necessary and the term "wheeled carriage" is intended to be interpreted in its broadest possible sense and to include, for example, not only wheels as such but also endless tracks, e.g., for use in conditions where the ground is very soft such as in swamps, paddy fields, and the like. Where the wheeled carriage is in the form of a trailer then it may have one or more sets of wheels at the open end thereof and may be adapted for towing from the other end thereof and one or more retractable legs may be provided at said other end thereof for supporting the wheeled carriage when it is not connected to a towing vehicle.

The invention will be more particularly described with reference to the accompanying drawings, in which:-

Figure 1 is a diagrammatic perspective view of apparatus according to the present invention comprising a load carrier and a wheeled carriage shown being moved into a position ready to lift the load carrier for transport,

Figure 2 is a diagrammatic perspective view of the apparatus of *Figure 1* showing the load carrier in raised position on the lifting means ready for transport, and

Figure 3 is a diagrammatic perspective view of the apparatus of *Figures 1* and *2* and showing the load carrier being tipped to empty material therefrom.

Figure 4 is a side elevation of another embodiment of load carrier and wheeled carriage according to the present invention, the wheeled carriage being shown in a position ready to lift the load carrier for transport,

Figure 5 is a view similar to *Figure 4* but showing the load carrier in an early stage of being lifted, and

Figure 6 is a view similar to *Figures 3* and *4* but on a smaller scale which shows the load carrier fully

lifted and which also illustrates in chain lines a tipping operation.

Referring to Figures 1 to 3 of the drawings it will be seen that the materials handling apparatus illustrated therein comprises a load carrier 1, which in the illustrated embodiment happens to be in the form of a bin, and a wheeled carriage 2.

The load carrier 1 comprises a lower ground engaging portion 3 of a width such that it can be straddled by the wheeled carriage 2 and an upper portion 4 which is wider than the lower portion 3 and is connected to the lower portion 3 by laterally extending step portions 5 which provide downwardly directed horizontal surfaces 6 the purpose of which will become apparent hereinafter. The load carrier is shown open at its rear end and as having a transversely extending shaft 7 for hingedly supporting a depending tail gate (not shown) which can be used to close the rear end of the load carrier. It will be understood that the load carrier shown in the drawings is merely illustrative and that it may take any suitable form such as a load carrying platform, cylindrical tank or the like depending upon requirements and the materials to be handled and all as hereinbefore described.

The wheeled carriage 2 comprises a main frame 8, a sub-frame 9 and an auxiliary frame 10. The main frame 8 comprises a pair of spaced side members 11 connected together at one end only by a transverse member 12 so that the main frame is substantially U-shaped in plan view. The sub-frame 9 similarly comprises a pair of spaced elongate members 13 and a transverse member 14 connecting the elongate members 13 together at one end only so that the sub-frame is also U-shaped in plan view. The auxiliary frame 10 is also U-shaped in plan view and comprises spaced longitudinally extending members 15 and a connecting member 16 connecting the members 15 at one end only. The three frames 8, 9 and 10 are mounted one upon the other with their closed ends adjacent one another and the arrangement is such that the carriage is open at its other end whereby it can be wheeled into a position in which it straddles the ground engaging portion 3 of the load carrier 1. The wheeled carriage 2 is shown in the course of being wheeled into said position in Figure 1 of the drawings.

The sub-frame 9 is connected to main frame 8 by parallel linkages 17 whereby the elongate members 13 will be maintained parallel with the main frame side members 11 when the sub-frame 9 is moved from its lowered position shown in Figure 1 to its raised position shown in Figure 2. The auxiliary frame 10 is pivotally connected as shown at 18 to the sub-frame 9 at the open ends thereof so that the other end of the auxiliary frame 10 can be lifted as shown in Figure 3 to tip the load carrier 1.

Movement of the sub-frame 9 between its lowered and its raised positions and raising of said other end of the auxiliary frame 10 is effected by means of a pair of hydraulic or pneumatic rams 19 on each of which is pivotally connected to a side member 11 of the main frame 8 and the other end of each of which is pivotally connected to one of the members 15 of the auxiliary frame 10. The arrangement

is such that the rams 19, when initially extended from their retracted positions, will move the sub-frame 9 from its lowered to its raised position and that further extension of the rams 19 will serve to raise said other end of the auxiliary frame 10 to tip the load carrier 1.

Releasable locking means shown diagrammatically at 20 is provided for releasably securing the load carrier 1 to the auxiliary frame 10 so that the load carrier 1 will be held secure for transport and for tipping as shown in Figures 2 and 3 respectively. Likewise releasable safety locking means 21 is provided between the sub-frame 9 and the main frame 8 for maintaining the sub-frame 9 in its raised position as shown in Figure 2. Although not shown in the drawings, suitable releasable locking means may be provided between the sub-frame 9 and the auxiliary frame 10 for ensuring that when the rams 19 are extended the sub-frame 9 will first be moved from its lowered to its raised position before any tipping of the auxiliary frame 10 takes place.

In the illustrated embodiment the wheeled carriage 2 is shown as a trailer having a towing bar 22 whereby it can be connected to a suitable motor vehicle for towing. As shown the trailer has two wheels 23 mounted in tandem on each of the side members 11 of the main frame 8 and a retractable leg 34 adjacent the tow bar 22 which serves with wheels 23 to support the wheeled carriage 2 when this is not connected to a towing vehicle. It will be understood, however, that any other suitable arrangement of wheels and/or legs may be adopted if desired. It will also be understood that the wheels 23 could if desired, be replaced by endless tracks. The wheels can be suitable either for use on the highway or may be of the wide flotation low pressure type for use on soft ground or for applications where it is necessary to spread the load as much as possible, e.g., where the apparatus is used in crop fields where too heavy a pressure could cause damage to the roots of the crops. It will also be appreciated that whilst the wheeled carriage 2 illustrated is in the form of a trailer it could, if required, be an integral part of a motor vehicle. However the trailer version is preferred since in many cases suitable tractors or other towing vehicles will be available and so a considerable capital saving will be able to be made.

From a perusal of Figure 2 it will be readily apparent that with a bin type load carrier 1 as shown the lower portion 3 of the load carrier is between the wheels of the wheeled carriage 2. This results in a low centre of gravity as compared with the known refuse handling systems referred to in the preamble hereof and results in the apparatus of the present invention being much more stable, particularly over rough terrain.

It will also be readily appreciated that the apparatus of the present invention is extremely versatile in that many different forms of load carrier can be used with the wheeled carriage and that both the load carrier 1 and the wheeled carriage 2 can be of any suitable size. Thus for example it is possible to envisage a system where in load carriers 1 of a particular length are deposited in a field of

using wheeled carriages of substantially the same length and that when filled with crops the load carriers are removed from the fields using the same wheeled carriage and are deposited on the nearest adjacent or accessible road. There the load carriers 5 can be transported two or more at a time, e.g., to a remote storage facility or factory for processing, using a wheeled carriage 2 of a length sufficient to carry said two or more load carriers.

10 A further advantage of the apparatus of the present invention is that the wheeled carriage 2 basically comprises only three U-shaped frames 8, 9 and 10 which can readily be fabricated from standard commercially available steel of suitable cross sections.

Referring now to Figures 4, 5 and 6 it will be seen that the materials handling apparatus illustrated therein comprises a load carrier 25, which again is in the form of a bin, and a wheeled carriage 26.

20 The load carrier 25 comprises a lower portion 27 provided with ground engaging legs 28 and of a width such that it can be straddled by the wheeled carriage 26, an upper portion 29 which is essentially wider than the lower portion 27 and which in the illustrated embodiment is also longer than the lower portion 27, and a tapered intermediate portion 30 connecting the upper portion 29 with the lower portion 27. The top of the upper portion 29 is closed by a suitable hood or cover 31 which may have one or more openings (not shown) therein to enable the load carrier to be loaded. A rear end of the upper portion 29 may be open or have an opening therein, which may be closable by a hinged flap or other suitable closure, to enable the load carrier to be emptied by tipping.

35 The wheeled carriage 26 is in the form of a trailer and has two wheels 32 at the rear end thereof and a towing bar 33 or other suitable means at the front thereof whereby it can be releasably connected to a towing vehicle (not shown). The wheeled carriage 26 comprises a main frame 34 which is substantially U-shaped in plan view and comprises a pair of spaced side members 35 which are connected together at their front ends only by a transverse member 36, the main frame being mounted on the wheels 32 by means of brackets 37 connected to the side members 35. Mounted on each of the side members 35 of the main frame 34 by means of parallel linkages 38 is an elongate member 39, the elongate members 39 being separate from one another and not joined together at one end as in the previous embodiment. Pivotally mounted on each of the elongate members 39 is a locking pawl 40 which, when the elongate members 39 are moved from their lowered position shown in Figure 4 to their raised position shown in Figure 6, engages with a releasable locking member 41 to lock the elongate members 39 in their raised position. Pivotally connected at 42 to the rear ends only of the elongate members 39 are a pair of spaced longitudinally extending members 43 which are connected together at their front ends by a transverse member 44 to form a substantially U-shaped tipping frame 47. The rear ends of the longitudinally extending members 43 extend rearwardly beyond the rear

ends of the elongate members 39 and a jack 45 is pivotally connected at one end to each of the main frame side members 35 and at the other end to the rear end of the adjacent longitudinally extending member. Suitable releasable locking means 46 is provided for retaining the load carrier 25 on the tipping frame 47.

The tapered intermediate portion 30 of the load carrier 25 provides two laterally outwardly and downwardly directed surfaces 48 for engagement by the longitudinally extending members 43 of the tipping frame 47, these surfaces 48 tending to self-centre the load carrier 25 on the tipping frame when the load carrier 25 is lifted to a transport position as is described below.

In the use of the materials handling apparatus illustrated in Figures 4, 5 and 6, the wheeled carriage 26 is moved into a position in which it straddles the lower portion 27 of the load carrier as shown in Figure 4 and the locking means 46 is engaged. The jacks 45 are then extended to move the elongate members 39 together with the tipping frame 47, from their lowered position shown in Figure 4 to their raised position shown in Figure 6, thus raising the load carrier 25 to its transport position shown in solid outline in Figure 6. When the elongate members 39 are in their raised position the locking pawls 40 automatically engage the releasable locking members 41 to lock the elongate members 39 in their raised position. If it is desired to tip the load carrier 25 the jacks 45 are retracted so that the tipping frame 47 pivots relative to the elongate members 39 about the pivot points 42 as shown in broken chain lines in Figure 6. Reversal of the above described sequence of events will first return the load carrier 25 and tipping frame 47 to the normal transport position and will then lower the load carrier 25 onto the ground so that the wheeled carriage can be moved out of engagement therewith. Figure 5 shows the situation where the elongate members 39 and tipping frame 47 have been raised to a position where the longitudinally extending members 43 of the tipping frame 47 have engaged the surfaces 48 of the load carrier 25 but the load carrier has not yet been raised from the ground.

CLAIMS

1. A materials handling system comprising at least one load carrier and a wheeled carriage for the transport of said load carrier, the load carrier comprising a ground engaging portion and at least one downwardly directed surface extending laterally outwards on either side of said ground engaging portion at a predetermined height above the bottom of said ground engaging portion, and said wheeled carriage comprising (a) a main frame having a pair of spaced substantially parallel side members and means connecting said side members together at one end only, and (b) lifting means mounted on said main frame and having a retracted position less than said predetermined height and a raised position greater than said predetermined height, the arrangement being such that, with said load carrier supported on the ground and said lifting means in

retracted position, said carriage can be wheeled into a position wherein said side members extend on either side of the ground engaging portion of the load carrier and said lifting means are positioned beneath said downwardly directed surfaces of the

load carrier so that moving the lifting means to raised position will raise the load carrier from the ground for transport on the carriage.

2. A materials handling system according to claim 1, wherein said downwardly directed surfaces of the load carrier are substantially horizontal surfaces which extend laterally outwards on either side of the ground engaging portion of the load carrier.

3. A materials handling system according to claim 1, wherein said downwardly directed surfaces of the load carrier are surfaces which extend laterally outwards and upwards from the ground engaging portion of the load carrier on either side thereof.

4. A materials handling system according to claim 1, 2 or 3, wherein the ground engaging portion of the load carrier comprises a load carrying portion of the load carrier.

3. A materials handling system according to claim 1, 2 or 3, wherein the ground engaging portion of the load carrier comprises leg support means for supporting a load carrying portion of the load carrier.

6. A materials handling system according to any one of the preceding claims, wherein the wheeled carriage comprises a motor vehicle.

7. A materials handling system according to any one of claims 1 to 5, wherein the wheeled carriage comprises a trailer.

8. A materials handling system according to any one of the preceding claims, wherein the wheeled carriage, or at least that part thereof which cooperates with the load carrier, is substantially U-shaped in plan view.

9. A materials handling system according to claim 8, wherein the main frame of the wheeled carriage comprises said pair of spaced substantially parallel side members and a transverse member or members connecting said side members together at one end only.

10. A materials handling system according to any one of the preceding claims, wherein said lifting means comprises hydraulic, electro-hydraulic, pneumatic or screw jack means.

11. A materials handling system according to any one of the preceding claims, wherein said lifting means comprises a pair of spaced elongate members each of which is connected to one side member of the main frame of the wheeled carriage and is movable between a lowered position and a raised position.

12. A materials handling system according to claim 11, wherein said elongate members are each connected to their respective main frame side members by parallel linkages.

13. A materials handling system according to claim 11 or 12, wherein each of said elongate members is movable between its lowered and its raised position by jack means.

14. A materials handling system according to claim 11, 12 or 13, wherein said elongate members

are connected together by a transverse member at the same end thereof as the main frame side members are connected together.

15. A materials handling system according to any one of claims 11 to 14, wherein means is provided on said elongate members for tipping a load carrier supported thereon.

16. A materials handling system according to claim 15, wherein said tipping means comprises a pair of spaced longitudinally extending members each of which is pivotally connected to one end of a said elongate member, said longitudinally extending members being pivotable between a normal position in which they extend substantially parallel to the elongate members and a tipping position in which they are inclined with respect to the elongate members.

17. A materials handling system according to claim 16, wherein said longitudinally extending members are connected together by a transverse member at the same end thereof as the main frame side members are connected together so as to form a substantially U-shaped tipping frame.

18. A materials handling system according to claim 16 or 17, wherein common means is provided for both moving the elongate members between their lowered and their raised positions and for moving the longitudinally extending members between their normal and their tipping positions.

19. A materials handling system according to claim 18, wherein said common means comprises jack means.

20. A materials handling system according to claim 19, wherein said jack means comprises a pair of jacks one end of each of which is connected to a said side member of the main frame and the other end of each of which is connected to a said longitudinally extending member.

21. A materials handling system according to any one of claims 15 to 20, wherein means is provided for locking a load carrier on said tipping means at least during a tipping operation.

22. A materials handling system according to claim 21, wherein said locking means also serves to retain the load carrier on the wheeled carriage during transport of the load carrier.

23. A materials handling system according to any one of claims 11 to 22, wherein releasable locking means is provided for locking said elongate members in their raised position.

24. A load carrier for a materials handling system according to any one of the preceding claims, the load carrier comprising a ground engaging portion and at least one downwardly directed surface extending laterally outwards on either side of the ground engaging portion at a predetermined height above the bottom of the ground engaging portion.

25. A wheeled carriage for a materials handling system according to any one of claims 1 to 23, comprising (a) a main frame having a pair of spaced substantially parallel side members and means connecting said side members together at one end only, and (b) lifting means mounted on said main frame and having a retracted position and a raised position.

26. A wheeled carriage according to claim 25, wherein said lifting means comprises a pair of spaced elongate members each of which is connected to a said side member of the main frame by parallel linkages and jack means for moving the elongate members between the lowered and the raised positions.
27. A wheeled carriage according to claim 26, wherein tipping means is provided on said elongate members for tipping a load carrier supported thereon.
28. A materials handling system substantially as herein described with reference to Figures 1 to 3 or Figures 4 to 6 of the accompanying drawings.
29. A load carrier for a materials handling system, substantially as herein described with reference to Figures 1 to 3 or Figures 4 to 6 of the accompanying drawings.
30. A wheeled carriage for a materials handling system, substantially as herein described with reference to Figures 1 to 3 or Figures 4 to 6 of the accompanying drawings.

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